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# The Relationship Between Economic Inequality and Innovation

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| <p>Economic inequality and innovation are both increasingly important issues in modern economies, affecting both nations' rates of economic growth and the overall prosperity and well-being of their citizens. High levels of inequality are generally seen to be detrimental for economic growth, in addition to contributing to a host of other social and political problems. Innovation, meanwhile, is recognised to be a cornerstone of the sustainable economic growth and technological advancement of a country.</p> <p>Rising inequality and decreasing rate of innovation have been identified as problems in most Western countries since the early 2000s, but both phenomena have exacerbated a great deal since the economic crisis of 2008. Although both lowering inequality and increasing innovation are on most nations' economic and political agendas, most countries are doing worryingly little in addressing the issues in real terms.</p> <p>Inequality and innovation have several links between them, and can affect each other through multiple different mechanisms. High degrees of inequality can serve to hamper a country's rate of innovation through various different means, while innovation can both lower and increase inequality, depending on the circumstances surrounding it. It is extremely important for nations and different supranational agencies to fully understand the nature of both issues, in order to be better equipped to address them. Countries need to also be aware of the different effects both phenomena can have in different circumstances – it seems that both inequality and innovation can generate different results depending on whether they occur in liberal market economies (Anglo-Saxon countries) versus more strategically coordinated market economies (European countries).</p> <p>Overall, it seems that improving the general population's access to high-quality education, ensuring that a respective society houses necessary support institutions fostering innovation and utilising a suitable amount of wealth redistribution are some of the most important mechanisms in ensuring that inequality is kept in check, and innovation is at its maximal level.</p> |   |
| Keywords  | Economic inequality, innovation, education, economic growth, liberal market economy, strategically coordinated market economy |

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## 1 Introduction

Economic inequality is an increasingly important topic in modern economics, affecting countries all over the globe. Although inequality has been mainly linked with developing countries, ever since the economic crisis of 2008 the phenomenon has also been identified as a wide-ranging problem in more developed nations. Economic inequality is an important issue for countries to analyse and understand, as it can have a great impact on a nation's economic well-being, overall growth and prosperity. On top of economic problems, inequality can also create and contribute to other issues, such as political instability, poverty, crime and corruption.

Another important aspect of a nation's economic performance is innovation: technological progress, new products and services are all essential parts of the process of increasing growth and maintaining a sustainable economy. As such, nations seek to maximise the level of innovation within their country, and minimise the factors which serve to diminish it. Innovation's roots are extremely difficult to define precisely, but some of the factors which seem to affect it on a nation-wide level are the quality and access to education, the prevalence of support mechanisms within an economy, and the level of inequality in access to necessary resources, such as financing and skilled labour – the size of the overall market for a potential new innovation is also important. All of the above factors are influenced by, to various degrees, the level of economic inequality within a country.

Inequality and innovation have several links between them, identified in the relevant literature. It is essential for all nations experiencing inequality, and seeking innovation, to understand these links fully, so that they can focus on addressing both issues both separately and together. Although most countries have put these goals at the forefront of their economic agendas, they are doing worryingly little in real terms - in the meantime, the situation is exacerbating at an extremely fast pace. Many countries are on a pattern of extremely slow growth or stagnation, while innovation has not returned to the levels it was before the economic crisis. The problem of inequality and innovation requires swift and precise action, if the global economy is to return towards growth within the next years.

## 1.1 Objectives

The problems associated with economic inequality and decreased innovation, both together and separately, have enormous implications for the global economy, and the various national economies of different countries all over the world. This thesis attempts to give a comprehensive, but concise, overview of the root causes and consequences (and importance) of both economic inequality and innovation. Following the discussion of these two phenomena separately, the text moves on to cover the complicated relationship between them. The various links are discussed based on different points of view and theories of multiple authors, and relevant examples from the real world are used to illustrate certain points where appropriate. Following the analysis, the thesis presents appropriate conclusions and recommendations for future action and/or research for the different countries and organisations aiming to solve to problems of high inequality and decreased innovation.

## 1.2 Research Question

Simply put, the research question is as follows: **“What are the links between economic inequality and innovation?”**

A series of sub-questions, which the thesis will also answer, are the following:

- What factors are important to maximise innovation on a nation-wide scale?
- What are inequality’s downsides and benefits?
- Does innovation have negative effects on economic growth or societal well-being and stability?

The thesis will briefly cover the topics of inequality and innovation separately, after which the text moves on to discuss the relationship between them. Chapter 2 is the first chapter of the literature review, and gives an overview of economic inequality: the chapter discusses the causes, consequences and principle mechanisms of the issue, while detailing its influences on innovation. Chapter 3 delves into innovation, giving a general overview of its importance, and highlighting the factors which can increase it, or decrease it. Chapter 4 focuses on inequality’s effects on innovation, both positive and negative, while Chapter 5 discusses innovation’s effects on inequality. Following the main body of the literature review, the thesis moves onto conclusions in Chapter 6, while Chapter 7 concludes the text with recommendations.

### 1.3 Methodology

The thesis is essentially solely a literature review, focusing on secondary research from a wide variety of sources. The text attempts to give a wide-ranging and well-researched overview of the various topics associated with the main questions, and pepper the text with personal insights where appropriate. When discussing the links between the two phenomena, the thesis aims to bring together the issues in a holistic manner, granting the reader a detailed look at the possible causes and mechanisms of a respective link.

### 1.4 Limitations

The usual limitations to research conducted only utilising secondary sources applies to this thesis as well. As such, the largest issues relate to the timeliness, trustworthiness and availability of literature and data. Although one tries to secure reliable sources, the information is always suspect, and could contain mistakes or intentional subterfuge. In addition, one struggles with becoming too captivated with a specific point of view or a theory regarding the issues discussed in the thesis, as most of the information has been pre-dissected by someone else. To combat this, one must always try to track down the sources of a specific theory or idea, and keep an open mind throughout the writing process.

The lack of trustworthy and precise data in different countries' growth and innovation policies' results is also an issue, as some of the phenomena and mechanisms are extremely difficult separate from each other. In other words, a clear causal relationship between two respective issues is in certain cases difficult to map out, as one cannot accurately determine to which degree an issue can affect another.

## 2 Economic Inequality

Inequality is a wide-ranging term, and it can be applied to a variety of contexts. Using the term inequality, this work refers to the economic variant, which can be defined as the variation in the distribution of income, pay or wealth between the citizens of a respective nation (OECD, 2017).

There are several measures through which economic inequality is quantified, one of the most common being the “Gini Coefficient” (The Equality Trust, 2017). The Gini Coefficient measures inequality in terms of income, wealth, or both, across a whole society, giving a value ranging from 0.0 to 1.0, with 0.0 meaning complete equality, and 1.0 meaning complete inequality. All OECD nations fall somewhere between 0.24 and 0.5, with Iceland having the lowest reported inequality of 0.244, and Chile having the highest of 0.465 (OECD, 2017).

Economic inequality has been a prominent topic in economics and politics alike throughout history, and has seen a resurgence in its importance and topicality during the past decade resulting from the financial crisis of 2008. A steep rise in inequality leading up to the crisis, and especially after it hit, has caused a multitude of political problems, economic issues and human suffering all over the globe (Stiglitz, 2012).

Economic inequality is associated with various disadvantages in terms of economic growth and the overall prosperity of a nation. Many authors, such as Joseph Stiglitz (2012), Raghuram Rajan (2010) and Thomas Piketty (2015) argue that inequality hampers growth directly by decreasing citizens’ buying power, lowering demand and threatening the public confidence for investment. More indirectly, inequality can negatively affect growth rates by decreasing general productivity due to poor education and access to medical, financial and professional support services, increasing political instability, and lowering innovation. Inequality can also generally lower the efficiency of a respective economy, as the lower-income population is increasingly dependent on government income transfers, and can develop various problems ranging from criminal activity to mental health issues, which cause an additional strain on the economy.

Many of the aforementioned economists championing for greater equality cite the legendary 20th century economist, John Maynard Keynes, for many of their arguments. Keynes was an extremely influential thinker in terms of redirecting the way governments

utilize monetary and fiscal policies to steer the economy towards growth in times of recession – or, ideally, to steer the economy to prevent the occurrence of recessions in the first place (Backhouse and Bateman, 2011). Fundamentally, Keynes recognized the most important factor driving economic growth, trough or recessions – the “mood” of the economy. This essentially means the feelings of confidence the different actors inside an economy have about the future of the market. Keynes argued that economic crises, previously thought to be part of the natural order of the business cycle, were avoidable, essentially being crises of confidence.

In addition to slowing growth, economic inequality can also be the driving force behind economic crises (Davidson, 2009). The growing disparities between the income and wealth levels of the rich and the poor can serve to spike growth rates for a while, as the well-off have the capacity to invest their resources into different businesses and projects. In the end, however, an extreme pooling of resources to a miniscule fraction of a society can backfire, as investment and overall spending grinds to a devastating halt in times of recession when the overall population has no wealth to invest, and the rich forego large investments due to fear of poor returns. As such, many economists and politicians argue for the necessity of greater equality in decreasing large macro-economic swings, in both national and global level (The Economist, 2015).

Keynes identified the phenomenon described in the paragraph above as the “paradox of thrift” (Backhouse and Bateman, 2011: pp. 68). Keynes argued that in times of economic uncertainty or recession, paradoxically, what is in the best interests of households can be drastically different from what is best for the economy as a whole. As such, it is the responsibility of the government to step in and re-direct the economy towards a path of growth and investment through monetary and fiscal policy, encouraging a positive mood, and offering assurances of the economy’s stability. By restoring confidence in the future, the government allows the population to resume spending, and producers to resume investing.

As a contrast to the negative effects associated with inequality, some economists, such as Milton Friedman (1962) and Robert Lucas (2004), argue for the positive influences inequality can have on economic growth. Both authors, along with a multitude of other classical economists, champion inequality as a positive phenomenon, promoting growth



in a fair and just manner – in harmony with this view, they tend to view wealth redistribution in a negative light, as it interferes with the natural workings of the market, and limits the potential to increase production.

Although the previously discussed negative effects of inequality weigh heavy, there is some merit to the arguments for its benefits as well: there is evidence showcasing that in the case of developed countries, substantive infrastructural and technologically innovative investment occurs more readily in societies with higher inequality (Barro, 1999). In this scenario, higher wealth disparities allow “successful” and entrepreneurial individuals to amass more resources, and thus direct them towards profitable, innovative new projects and activities which end up benefiting the whole society. Simon Kuznets’ famous “Kuznets curve” theory (Summer, 2004) also seems to support the idea that economies need inequality in order to grow, as effective increases in production and investment require large wealth disparities. Still, according to Kuznets’ theory, inequality should automatically decrease as an economy moves towards maturity, and shifts its primary resource demand from labour and raw materials to human capital – this has not been the case for many liberal capitalist societies, which still struggle with inequality.

One can recognize the value of some degree of inequality in promoting investment, but the effectiveness of this type of resource pooling is questionable at best. As Elizabeth Kregor (2016) argues, modern economies function very differently compared to the economies of the past – whereas large-scale investment by the rich and amply available, cheap labour were the cornerstones of economic development in the 19th and 20th centuries, the modern variations are more dependent on the sufficient amount and effective utilization of highly educated human capital. As discussed in the previous paragraphs, inequality hampers the overall education of a population, which makes its promotion in great quantities a dubious proposition at best.

The other benefit which Friedman (1962) and Lucas (2004) both highlight relates to economic inequality’s motivational capacity in promoting innovation and growth. Inequality effectively serves as an incentive for the entrepreneurial individual to create new innovative products, services or production methods, and seek to make their fortune solely through their personal effort. In this sense, the motivational boost created by a sufficient degree of inequality has two distinctive facets: on one hand, it encourages people to work harder, as they have to “earn” their right for a comfortable life. On the other, ade-

quate levels of wealth disparity can make the proposition of innovation and success enticing, as the individual is ensured that he or she will be able to enjoy the fruit of their labour. As such, economists such as Lucas (2004) see the income disparities evident in the United States' economy as a fair and positive trait, which signals the health of the economy.

Although one finds it hard to completely dispute the motivational benefits associated with economic inequality, the evidence seems to indicate that the degree of income disparities suggested by classical economists are vastly overstated. Thomas Piketty (2015) argues that most nations do not see a large disintegration of motivation among high-earners and innovators when tax rates are increased, unless the increases are extremely sizeable. Research conducted by Arnold (2008) for the OECD comes to similar results, finding that a nation's overall performance is not affected a great deal by increases in tax rates, especially when taxing wealth and property – in actuality, they can even serve to improve performance, as the overall spending levels and health of the economy is boosted by re-distributed wealth.

Keynes (Backhouse and Bateman, 2011), for example, suggested that the government should take an active role in wealth redistribution in order to increase sustainable growth. In stark contrast to Friedman (1962) and Lucas (2004), Keynes argued that greater equality in wealth and income will actually allow a nation to increase production, instead of decreasing it, as there is greater (and more stable) demand. As such, the authors see different things as more valuable regarding innovation and production: Friedman and Lucas favor the greater maneuverability producers receive due to resource pooling, while Keynes values the stability and amount of demand resulting from the general public having the finances to purchase products and new innovations in greater amounts.

Overall, after reviewing the relevant literature, one comes to the conclusion that a reasonably low degree of inequality is necessary to ensure an economy's overall health. Signs of economic health are, for example, high employment rates, high consumer spending and consumer confidence, bank lending and interest rates, and business indicators, such as investment rates (Sloman and Garratt, 2013).

In conclusion, despite some of its positive attributes, economic inequality has more negative effects on economic growth, innovation and the overall well-being of a society and

its citizens, and should be sought to maintain under control. Still, it is important to recognize inequality's positive attributes – the motivational, redistributive and resource-gathering benefits of inequality are arguably absolutely essential for the effective functioning of a capitalistic economy. As such, one can theorize about an “optimal” amount of inequality, where its cost-benefit ratio would be the most favourable. As discussed in the previous paragraphs, different authors have different opinions on what this optimal amount would be. In addition, it is also heavily influenced by the circumstances of the situation, in terms of the country and period of history in question.

### 3 Innovation

Innovation can be defined using various different methods, examples being: the number of produced patents, new products, economic growth (especially in high-tech sectors), education levels and the amount of ongoing research and development within a nation (Bhasin, 2012). In referring to innovation, this text utilizes a fairly broad quantification, using all of the above metrics – in essence, innovation can be defined as the creation of a new idea, device or method. Innovation can be roughly divided into two categories, which are incremental innovation (meaning a more gradual development in a product or production process) and radical innovation (meaning a rapid and sudden development in a product or production process) (Hargadon, 2015). It is also important to clearly differentiate innovation and invention, as the former always involves bringing something new to the market, while the latter can occur without changing an economy in real terms.

Innovation is an extremely complex process, and involves many different social, biological, political, psychological and other environmental factors (Basalla, 1988). It is exceedingly difficult to quantify the exact reasons behind why some individuals are successful innovators innately, and some are not. The general character traits associated with innovators are, among others, creativity, high amount of intrinsic motivation, intellectual curiosity and independence (Hargadon, 2015).

Innovation is seen as a positive phenomenon in virtually all circumstances, except where it results in the creation of human suffering – in these instances, also, someone usually stands to benefit despite the harm others might experience (examples being weapons development or environmentally pollutive, but lucrative, new production technologies). As such, most nations and companies seek to promote innovation as much as possible, and it is seen as a cornerstone of sustained economic growth and development (Sloman and Garratt, 2013). Innovation has been extremely important for growth throughout history, but its importance is increasing even more during modern times, as technology improves at an ever accelerating pace and the demand for more and more abstract and esoteric new inventions and products becomes more apparent.

Innovation can benefit a nation in two ways: firstly, innovative new products, production methods, services or ideas can significantly boost a country's economic performance. Secondly, innovation can improve the day-to-day lives and well-being of a country's citizens directly. A good example is the large-scale utilization of the internet for civilian purposes – not only did the inclusion of internet in business activities create completely new

industries and improve firms' operational capabilities, its positive effect on individuals' normal, everyday life was dramatic.

The causes, or roots, of a specific innovation are extremely difficult to define, and they vary from case to case. Although anyone, from any background, has the potential to create something new and innovative, large-scale innovations are usually discovered by individuals who have received a good education, and have access to basic support structures around them, such as: a functioning societal structure and access to financing, raw materials, labor and different support institutions (Hargadon, 2015). Demonstrating this point, countries with strong education systems and well-organized and reasonably fair societal structures have proven to effectively foster high innovation levels, measured by the amount of registered patents and growth in high-technology sectors (Ornston, 2012).

As such, despite the "human touch" innovation requires by necessity, new ideas are most often put into practice, if not always generated, in more advanced nations (Bell and Pavitt, 1997). Although someone from poor economic and social conditions can come up with an innovation, as in conceiving a new idea, device or method, they might find it extremely difficult to manifest it in the real world. It can be argued that innovation effectively requires the strong financial bases and access to resources that developed and economically healthy countries offer.

In conclusion, this paper treats innovation as a mostly desirable phenomenon, resulting from its positive effects on nations' economic performance, overall prosperity and well-being of its citizens. Innovation requires 1. Good education 2. Access to support services and institutions 3. A fair and well-functioning societal structure and 4. Access to necessary resources, in terms of cash, labour and raw materials.

## 4 Inequality's Effects on Innovation

### 4.1 Inequality, Education and Innovation

One of economic inequality's most unfortunate results is the extremely negative effect it has on a nation's overall education levels (Stiglitz, 2012). Although the small, wealthy minority of an unequal country's population has the capability to attain decent education for themselves and their families, the overall population can suffer from a decreased access to, or the lowered quality of, higher or even lower education. The United States provides a good example – although the worryingly significant gap in education levels between children from wealthy and poorer families was slowly contracting during the period between 1970 and 1990, recently the differences have begun to increase again, largely resulting from increases in economic inequality. Currently, in some cities in the United States, less than 10% of poorer students (often from minority backgrounds) are effectively prepared for college level work after graduating from high school, compared to the almost 50% of more well-off students (Ireland, 2016). Overall, the education levels of the United States have radically decreased during the past few decades, and the link between this phenomenon and inequality is almost undeniable (Goldin and Katz, 2008).

Economic inequality does not only lower a country's education levels by directly affecting the quality of government-run, free schools or decreasing the access of the poorer population to better-performing, private educational institutions – it also increases a variety of other negative societal phenomena, which also contribute to a growing disparity in learning and education. Inequality worsens poverty rates, creates unsettled and unsafe neighborhoods, diminishes the quality and time reserved for parenting and significantly increases the potential for a child to experience personal trauma (Ireland, 2016). As such, a child suffering from economic inequality is destined to fail academically: in addition to being most likely enrolled in an underperforming school in a run-down and unsafe environment, he or she is also very likely experiencing at least one of the other mentioned phenomena caused by inequality.

As mentioned in the chapter 3, the quality of an individual's education has a drastic impact on his or her ability to be an innovator in later life. Toivanen and Väänänen (2011) find that people with a strong educational background and performance, often with Master or Doctoral level degrees, are much more likely to innovate than lower-performing students, measured for example by registered patents. One can also infer similar results

from small Nordic country Finland's successful shift from a resource-based economy to an innovation-based economy onwards from 1980s onwards (Ornston, 2012). Finland invested heavily in education beginning from the 1950s, providing children and young adults with an equal access to education and high-quality teaching. As a result, the country produced large amounts of well-trained professionals in a variety of fields, allowing the nation to create and foster large and successful companies in many high-technology, innovation-dependent sectors. The country also placed a strong emphasis on vocational training, or further education, which allowed many firms in traditional industries (paper, pulp, and forestry, for example) to remain competitive through incremental innovation.

Overall, it seems that a well-educated workforce across all industries, and pervasive throughout a respective industry's whole value chain, will contribute to both radical and incremental innovation extremely positively (Baumol, 2005). In addition to firms having access to academically highly educated employees for their R&D departments and managerial positions, the whole of society is essentially filled with individuals who possess at least basic competency in the subjects most required by innovation, such as the core sciences of math, physics and chemistry.

Reviewing the available evidence and data, one can argue that one of the most effective ways to boost innovation would be to improve the overall population's access to high-quality education. Although the most important overall factor to achieve this goal lies in reducing inequality, there are other valuable ways to aid the situation. A re-imagining of the school curriculum, providing teachers with better opportunities for teaching different subject areas holistically, and giving them more one-on-one time with students, is one of the ways which many scholars and pundits argue would boost education levels without requiring too much additional financing (Luther, 2000). Interestingly, this is something Finland has also started attempting beginning in 2016, hoping to stay a leader in the global education ratings, especially since the country's financial (and innovational) decline since 2008 financial crisis (Zareva, 2016).

Another way to reportedly improve future students' chances of succeeding in school is to improve pre-school "education" and home life: according to Burger (2010), starting from a child's second year, the differences in the amounts of intellectually and emotionally developing activities, such as playing, talking with adults and different hobbies, can have a drastic impact on a child's future educational success. As such, government-

sponsored information campaigns directed towards parents, in addition to re-imagined nursery and pre-school programs, could significantly improve a nation's education levels.

In addition to boosting general educational performance, countries should focus on gearing education specifically towards innovation. As previously stated, the specific underlying skills and attributes associated with innovative people vary from person to person (also depending on the general field or area of innovation), but there are some general traits innovative people possess on which several authors and scholars agree upon (Bagley, 2014). Through changes in their focus, and methods of teaching, schools could attempt to nurture and develop the attributes which are found in most successful innovators and entrepreneurs, such as intrinsic motivation and curiosity, social and collaborative skills, and creativity. On top of nurturing these general innovational traits, countries should re-direct school curricula to better fit the needs of the 21st century: subjects such as programming, high-level mathematics and sciences, analytical thinking and effective communication are paramount in ensuring that modern graduates are up to the task of not only creating, but also executing, new innovations (Ireland, 2016). In addition, countries should place a greater emphasis on vocational training, as it contributes to incremental innovation in many medium to low-tech industries (Huo, 2015).

Although countries have the capacity to improve on certain aspects of education even without additional financial input, any major changes to public education do require increased government expenditure towards improving schools, teacher training and salaries, and enacting the aforementioned changes in curriculum, not to mention addressing the other negative social phenomenon caused by economic inequality. As such, inequality can be argued to have an extremely negative effect on education, in turn lowering a country's potential capacity for innovation. As a consequence of lowered innovation, a nation can experience a host of economic and social problems, created by a lack of national income and growth. In this sense, the relationship between inequality, education and innovation is a vicious circle which repeats itself unless cut off through effective reform.



## 4.2 Inequality Reduces the Market Size for New Innovations

Inequality can also reduce innovation by decreasing the market size for new innovative products and services (Zweimüller, 2000). In most scenarios, innovation is extremely dependent on private funding and the eventual consumer interest towards the final product once one has been finished. Although some research and development is subsidized by governments or different international organizations out of necessity or for reasons of the “public good”, most innovation is conducted in the name of financial gain. As such, the lowered economic performance and lack of demand caused by high degrees of economic inequality can significantly hamper the process of creating a new innovation, or getting it to the market.

According to Timmons and Bygrave (1986), the role of venture capital is crucial in fostering innovation, and it is responsible for the creation of many of the most famous innovations throughout recent history. As private financiers obviously first and foremost seek financial gain, they base their decision to fund, or not to fund, a specific project or company on the prospects of the eventual product or service actually succeeding in the market place.

One can also highlight a variety of eclectic examples of modern innovations which could benefit people either through improving their day-to-day lives, or by improving the living conditions and future prospects of earth as a planet, such as: electric cars, renewable energy sources, and different organic and environmentally friendly food products. Although all of the aforementioned innovations receive some funding in terms of private equity or debt arrangements, they are being developed at arguably sub-par paces resulting from a lack of demand in the marketplace, partly due to inequality (Kerr and Nanda, 2014). Most people simply cannot afford to buy these sorts of products at their current, quite high, market prices, which lowers demand - this in turn lowers a venture capitalist's interest in investing in the respective innovations, and so another vicious cycle is born.

Innovation could arguably be boosted quite drastically by an increase in wealth and income redistribution - if more people could afford new and innovative products, the innovators (and their financiers) would find additional motivation for creating and executing more innovations in the future. High degrees of inequality also serve to ensure that the only people capable of investing in new innovations are the rarefied, extremely well-off

few, as a significant part of the population is just struggling to make ends meet. In a situation of economic downturn (to which inequality often contributes and vice versa), investment can decline extremely rapidly, as the only people capable of supporting innovation see no profitable reason to do so (Davidson, 2009).

In recent years new financing models have come to the fore, and remedied the situation somewhat: good examples are the different internet-based crowd-sourcing platforms, such as Kickstarter (Mitra, 2012). These platforms allow normal people to make smaller contributions, often ranging from a few dollars or euros to a few hundred, to a project while allowing them to utilize the strength of the crowd to amass significant sums of money. If a project is completed successfully, the contributors either get access to the final product, or can receive it at a discounted price, often depending on their level of financial involvement.

Still, crowdfunding has various risks and problems associated with it, especially when the funders are to receive an equity stake in a respective firm seeking cash, instead of just being promised the end product at a discounted price (Blanding, 2013). Often the smaller caliber firms seeking financing have significantly more risk associated with their operations compared to other companies that have secured funding through more traditional means. In addition, one could argue that crowdfunding causes market distortions: as many of the potential funders for a specific company or project are not professionals in either finance or in the field of the product, they are in more risk to fall for empty or inflated promises in terms of the success of a respective company or product. As such, companies which in reality do not “deserve” funding can draw resources from the economy through utilizing the spending power of normal households.

Economic inequality can be deemed to harm innovation through diminishing market sizes, and lowering private investors’ interest in funding different projects. The most effective way to remedy the issue is increased wealth redistribution, and reduced inequality, but the situation can be aided by the utilization of different sources of financing, such as crowdfunding platforms, as long as the risks and negative aspects of these alternative forms of gathering investment are recognized.

### 4.3 Inequality Decreases Innovators' Access to Resources

In addition to education, innovation is heavily dependent on a potential innovator's access to the different resources he or she might require during the process of creating something new. These resources can take a variety of forms depending on the specific innovation, and can range from raw materials and skilled labour to different intellectual resources, such as previous research or access to patents (Hargadon, 2015). Economies with higher inequality often see an erosion in the amount of available resources, caused by the variety of issues that inequality brings in its wake, such as: decreased growth, lowered tax amounts and decreased public investment in various support institutions.

One of the other reasons besides education behind the success of high-equality countries, such as Finland, Sweden and Denmark, in regards to innovation is the availability of the necessary resources for innovation (Ornston, 2012). Finland, for example, used to offer its entrepreneurs extremely good support through different government-run agencies and organizations aimed at promoting innovation: these institutions helped new businesses by helping them secure resources, taking part in different joint ventures in terms of research and development, and fostering greater collaboration between different firms inside the economy, essentially acting as a liaison to establish effective communication protocols (Simonen and McCann, 2008). Recently, this trend has started to decline: Finland has continually reduced the funding of TEKES, the Finnish Funding Agency for Innovation (which handled a lot of the aforementioned support), during the past decade, while also reducing the funding to further and higher education (Pilke, 2017). This lowers the quality of teaching, reducing the skills and knowledge base of the population. In addition, Finland has also cut back on funding for several other key support institutions, which aid both students and low-income or unemployed citizens: both study and housing allowances, for example, have been diminished during recent years. As a result, Finland is arguably not as effective in fostering innovation compared to the country's heyday in the time period between 1980 and early 2000s.

The liberal market economies of the United States or Great Britain do not promote the same, egalitarian access to resources still evidenced by countries such as Finland – Schiller (1996) argues that the inner workings of the US's high-technology industry functions essentially like an "insiders' club". Newly entering firms find it increasingly difficult to enter into the inner circle of high-tech companies, and can find themselves unable to

operate efficiently due to poor access to financing and other resources. As such, in the companies in possession of potentially lucrative innovation ideas or patents find themselves being assimilated by the larger technology companies through acquisitions. Although this allows the innovations to hopefully reach the market, the industry landscape stays extremely homogenous. This can in turn contribute to more inequality, as the proceeds from innovation are kept mostly in the hands of the high-tier, corporation elite.

Interestingly, Baumol (2005) argues that the homogenous structure of high-technology industries could also decrease radical innovation, as breakthrough innovations are mostly created by independent innovators and entrepreneurs, while larger corporations mainly focus on incremental innovation. This proves an interesting contrast to the findings of Huo (2015) (discussed in Chapter 5.1), who states that radical innovation is more prevalent in liberal market economies, although these are usually the societies hosting mega-corporations. As such, the findings seem to clash in terms of arguing which type of a society produces more radical innovation: liberal market economies hosting larger corporations, or the more strategically coordinated market economies.

#### 4.4 Inequality Allows Innovators and Investors to Pool Resources

As discussed in Chapter 4.3, inequality can hamper innovation by decreasing potential innovators' access to necessary resources. On the other hand, economists such as Robert Lucas (2004) and Milton Friedman (1962) both argue for the positive benefits of inequality on innovation in terms of resource pooling. In essence, they offer a contrasting view to the claim that inequality hampers the process of innovation through decreasing individuals' access to resources – they do not deny it as a phenomenon, but see it as a positive attribute.

If one sees the overall capitalistic economic system as free and fair (and functioning very close to the ideal of perfect competition), one also accepts that the consequences and results produced by that system are perfect, or at least very near it. According to this view, the inequality in the upper tiers of society is evidence of the market functioning in a fair, just and effective manner. It allows the innovative, hardworking and efficient individuals to amass the necessary resources they need to innovate, benefiting the whole society by increasing productivity and generating wealth, which in turn will trickle down the societal ladder (Lucas, 2004).

The question of effective resource gathering in terms of innovation is an extremely contested topic, and ties together heavily with the aspect of motivation (discussed in Chapter 4.5). As mentioned in Chapter 2, research by Barro (1999) suggests that some degree of innovation might be dependent on inequality, although it is very difficult to pinpoint exactly why that is, as in: does this phenomenon have more to do with resource pooling, or the motivation boost created by high inequality? Although one can see the logic of this argument, and even see it to be true in many current economies with high degrees of inequality, it is difficult to unequivocally state that without high inequality these types of resource-intensive investments would not be undertaken.

In other words, as innovation occurs in both more equal and unequal societies, who is to say that the type of innovation described by Barro (1999) would not take place even in the presence of lower inequality (which would arguably boost innovation through improved education and other mechanisms), only through different channels? As identified by Ornston (2012) and Blomström, Kokko and Sjöholm (2002), the innovation levels in Finland could be stated to have been the best in the world during the period between 1990 and early 2000s – although the country had very low degrees of inequality, innovation could be funded through government-backed and private loans, and by amassing the resources of multiple companies together. In addition, the country's overall ability to innovate benefited greatly from the equal distribution of high-quality education and the prevalence of government sponsored support institutions.

As such, one tends to come to the conclusion that the beneficial effect of high inequality on innovation is mostly due to its motivational aspects (discussed in Chapter 4.5), rather than the ability of certain individuals or corporate entities to amass massive amounts of wealth and resources.

#### 4.5 Inequality Increases the Motivation to Innovate

In addition to allowing innovators and investors to pool the resources necessary for innovation, inequality's other positive influence on increasing innovation relates to motivation. As argued by Lucas (2004) and Friedman (1962), a suitable degree of inequality is necessary for stimulating entrepreneurship and encouraging creative individuals to engage in innovation, as they are guaranteed the opportunity to enjoy the financial rewards for their work.

Researching the factors that encourage US federal workers to innovate, Fernandez and Pitts (2011) find that the expectancy of innovation being rewarded is one of the main reasons employees will seek to be innovative, as identified through questionnaires. The authors also found that data from a 2006 US Federal Human Capital Survey corroborates the questionnaire results, with rewards for innovation resulting in higher amounts of employee-generated, actionable ideas. Other factors deemed important were employee training, development and empowerment, and good relationships with supervisors and top leadership. Hargadon (2015) and Sloman and Garratt (2013) also agree on financial incentives' importance in fostering innovation.

In essence, the above findings demonstrate the workings of basic human nature: we wish to be rewarded for our efforts. As such, one could state that many potential innovators do not innovate for the sake of the common good, as much as for their own personal gain. In terms of the whole economy, inequality is an important part of creating this motivation as it ensures that an innovator will be able to keep the financial rewards from his work, and not have to lose a significant portion to taxes, for example.

One can immediately recognize the truth in the above statements, as the prospects of financial rewards are one of the most important factors in ensuring that modern capitalistic economies keep going and function properly. A certain degree of inequality is clearly essential for innovation – again, the question is: how much is the correct amount? Despite inequality's benefits, societies should take into account to other contributing factors to innovation, such as equal access to high quality education and other resources. As such, one has to ponder which of the various contributing factors are most important, and therefore to be prioritized? Lucas (2004) and Friedman (1962) see the inequality created by the United States' economy as the most important factor in increasing production, as it increases motivation to innovate and work hard, and allows innovators and investors to pool resources. Many others, such as Keynes (Backhouse and Bateman, 2011), Stiglitz (2012) and Davidson (2009), on the other hand, value the other contributing factors, such as education, as more important in maximizing innovation and productivity.

In contrast to the findings identifying financial incentives as the most important motivational factors behind innovation, one can also highlight various different viewpoints on the primary motivations. Joseph Schumpeter (1934, pp. 94) argued that the most important motivational factor increasing innovation was not the accumulation of private

property, but instead the pure joy of creation. In this sense, Schumpeter has a much more positive view of the basic workings of the human mind – according to him, an individual is most motivated to innovate because of an innate drive to be creative and productive. This viewpoint would support the greater importance placed on equality, as it promotes innovation in all the other fronts except motivation – if the motivation to innovate can also be driven by other forces besides high degrees of inequality, it would be the most logical to minimize inequality as much as possible, while still maintaining some of its motivational benefits.

The topic of motivation is extremely contested in the relevant economic literature, as it deals more with elements of human psychology than economics. As mentioned, most classical economists tend to lean towards financial motivation as one of the primary drives for innovation – however, most psychological theories on motivation identify intrinsic motivation as the most important factor in increasing innovation and productivity. The “Effectance Motivation Theory”, for example, argues that intellectual challenge, and the following internal feeling of accomplishment when a difficult task is achieved, is much more capable of generating sustainable motivation to innovate (Mullins and Gill, 2016). Similarly, the classic of all motivational theories, Maslow’s Hierarchy of Needs (Mullins and Gill, 2016), places “self-actualization” (meaning internal fulfillment) as the highest goal of a human psyche, and arguably producing the best results in terms of innovation. As such, psychology seems to indicate that the business world might be placing too much emphasis on financial rewards regarding innovation – still, one must also recognize the role of money as a sign of status and accomplishment in modern societies. In essence, financial rewards can increase motivation in two ways: firstly, by appealing to an individual’s desire to accumulate material wealth in order to live a comfortable life, and secondly by serving as a symbol of success to others (and to the person themselves).

In researching the motivations resulting in innovation in India, Bhaduri and Kumar (2009) find that purely extrinsic motivations (such as financial compensation) drive only a small part of innovative individual behaviour – instead, strong levels of intrinsic motivation seem to result in higher levels of innovation and sustainable growth. As such, the authors’ findings seem to corroborate the motivational theories discussed in the previous chapters. Overall, it seems that intrinsic motivation trumps extrinsic motivation in importance (at least in India’s case), although both are central. The balance between intrinsic and extrinsic motivation could also be partially influenced by cultural factors, which make it difficult to define on exact terms (Mullins and Gill, 2016).

## 5 Innovation's Effects on Inequality

### 5.1 Innovation Contributes to the Creation of Inequality

Despite the positive attributes innovation has in terms of economic growth, prosperity and the overall well-being of a nation's citizens, it also has a variety of less-desirable traits. One of the unfortunate side-effects of innovation is its tendency to increase, or worsen, economic inequality – this can happen through a variety of mechanisms, and to different degrees depending on the type and current state of a respective economy.

Huo (2015: pp. 162) highlights the differences between liberal market capitalism and strategically coordinated market capitalism in terms of the types of inequality innovation can serve to exacerbate. In strategically coordinated economies (economies which conduct a large part of communication between different market players through non-market forms, such as Finland or Germany) innovation increases inequality “from the bottom”: this is the more traditional view on innovation's effects on inequality. In this scenario, the educational demands of innovation weed out the people with less desirable school backgrounds, and as the overall supply of educated workers falls, the wage premium for educated workers rises, in turn increasing income inequality. In this sense, inequality grows from the bottom: although many available positions require only a “fair” amount of education, the people at the bottom of the societal ladder can find it hard to attain even that.

Schiller (1996) finds that in societies with medium-to-high degrees of inequality, innovation can contribute to the creation of the nation's economic “insiders”. The “insiders” are the portion of the population who, due to various economic, political and historical reasons, have access to high-quality education and the various other resources required by innovation. As they are the only ones capable of innovating (to a large extent, at least), they are also the only ones reaping the financial benefits brought by their innovation. This creates yet another vicious, repeating cycle: the insiders innovate and receive hefty compensation which widens the income gap, and allow their offspring to receive a good education - this in turn allows their offspring to become the new insiders and continue the cycle.

Huo (2015) argues that innovation can also exacerbate inequality “from the top” – this phenomenon is usually more prevalent in liberal capitalist economies. This happens through two distinct, but connected, effects: firstly, the demands of the job market drives



students to essentially “over-educate” themselves in order to effectively compete against each other for the top positions within different industries (often these positions are the ones which demand, and allow, innovation to take place). This phenomenon can be explained by the lack of coordination predominant in more liberal market systems: as there is less coordination between firms, the government and educational institutions, students receive less “directed” training towards different positions, and have less practical skills usable in the respective position to which they wish to apply (Goldin and Katz, 2008). This leaves them with only one front on which to compete: education. As education requires financial resources that not all students in an unequal society can afford, only the reasonably wealthy can effectively attain top-level jobs. The second effect, described by Huo (2015), then allows the innovation taking place in these types of positions to drive an increase in income inequality, as the financial benefits of innovation stay in this very narrow top echelon of highly-educated, well-off citizens. In this scenario inequality grows from the top, as only the high-achievers, in terms of wealth and education, have access to the top positions in a respective economy.

One can immediately see the main problem with the phenomenon described in the previous paragraph: when only the people with access to the best education and degrees (which in most cases requires finances which most citizens do not have) have the opportunity to get the top positions within different industries regardless of practical competence, the functioning of the fair and free capitalistic system is undermined. A job might not go to the best, most innovative person with the best potential – it goes to the one with the highest degree and best papers. This hampers the overall effectiveness of the economy, and lowers the pace of innovation.

It is also important to make a distinction between the two versions of innovation: radical innovation and incremental innovation, and their respective capacities in increasing inequality. Radical innovation seems to increase inequality more due to it allowing innovators to charge higher rents from rest of the society. Huo (2015) and Baumol (2005) both find that completely new products cause much greater wealth creation (and wealth transfers) than incremental innovation. As such, the differences in inequality between the United States (a liberal market system) and many European countries (more coordinated market systems) can partly be explained by the different types of innovations occurring more in each respective economy: the United States houses more radical innovation (and more inequality), while European countries create more incremental innovations, and thus have less inequality. Still, it is extremely difficult to say which comes first and

then creates the other, inequality or a certain type of innovation – most likely, once again, both re-enforce each other and create a continuous cycle.

Another issue resulting from over-education relates to the inflation of academic degrees. As even lower-tier positions require candidates to possess largely unnecessary higher academic education, a significant portion of the overall academic knowledge of the labour force goes effectively unused (Baumol, 2005). This can distort the level of innovation within the economy further, as highly-educated workers are tied up performing routine tasks, which do not require the level of education and knowledge they possess. As such, the resources, in terms of time and money, of training people academically are going to waste, as even a holder of a higher degree might end up working a routine, very practical skills- based position.

Interestingly, although one would assume that the only consequence of “from the top”-inequality would be the decreased amount and effectiveness of innovation, it can also have an impact on the type of innovation most experienced in an economy. According to both Huo (2015) and Hall & Soskice (2001), over-education leads to more radical innovation, as opposed to incremental innovation. Some of the mechanisms behind this are unclear, but it seems that an abundance of highly educated people (in subjects essential to technological innovation, such as physics, math and chemistry) all across an economy is a major contributing factor. As such, radical innovation does not occur only because the R&D workers of a specific industry, sector or company are highly educated in science – it occurs because the leaders, managers, marketing and sales people and even the customers are also highly educated in science. Essentially, a firm or an industry is able to tap into a larger pool of highly educated human capital for the purposes of innovation – it might also create a more benign overall environment towards technological advancement, as the people possessing the knowledge required by hi-tech innovation are not so few and far between.

Although many state over-education to be a largely negative phenomenon and mostly prevalent in liberal market economies, one can apply the principles of the phenomenon’s more positive attributes to various different scenarios as well. As discussed in Chapter 1, the benefits of a nation possessing a solid base of highly educated individuals across the whole society (similarly to Finland) will contribute extremely positively to overall innovation levels. As the problem of over-education is reportedly much lower in these types of countries, one can infer that the more coordinated European market economies are

more effective in fostering inequality-friendly innovation not only due to the access to and quality of education, but also due to the strategic nature of training people for different positions across the whole society. Ornston (2012), for example, argues that strategically coordinated education and high degree of communication among the different market actors inside the Finnish society contributed greatly to the country's advancement in many high-tech sectors beginning from the 1990s.

Still, although strategically coordinated market economies seem more able to promote sustainable innovation, the higher amounts of radical innovation created in more liberal economies prone to the over-education effect should not to be taken lightly. The distinctive effects of radical and incremental innovation, respectively, on inequality are discussed in more detail in Chapter 5.3, but overall, radical innovation can greatly aid a country's prosperity and success in the global market place.

## 5.2 Innovation Increases Social Mobility

Innovation is often highlighted by economists for its ability to disrupt the status quo of a respective economy in a positive way by introducing new products, and re-inventing and improving old established processes and production methods. Similarly, innovation can also serve as a disrupting mechanism in terms of social mobility, as in theory it can allow individuals from all walks of life to advance on the societal ladder despite their personal circumstances (Hargadon, 2015). As such, innovation is one of the most important parts of the ideal of many classical economists' (Friedman, 1962; Lucas, 2004) economic philosophy, where hardworking and innovative individuals are rewarded for their efforts, and can accordingly achieve success despite their background, and whatever disadvantages and hardship it might hold.

Innovation does clearly allow for social mobility, and the world is filled with examples of innovators from modest beginnings who have created extremely successful products and companies. People such as billionaire software innovator Larry Ellison and Do Won Chang, the founder of clothing chain Forever 21, are examples of individuals who amassed great personal fortunes, and advanced to the very top of the American society, owing to their work ethic and innovativeness, despite their poor beginnings (Stone, 2015). As such, both exemplify the American dream perfectly, and according to Friedman (1962) and Lucas (2004) are a sign of the market functioning correctly: winners, despite lacking inherited wealth or other resources, are separated from the losers.

Although social mobility undoubtedly happens resulting from innovation, one must once again go back to the roots of the issue, as in identifying the reasons which allow an individual to innovate. As discussed in previous chapters, a good education and a reasonably stable childhood are important contributors to an individual's capacity to be a successful innovator in later life. Although both of the examples in the above paragraph amassed their fortunes from admittedly modest beginnings, they had a decent background in education and relatively stable early home-life. Moreover, it is increasingly difficult to find examples of hugely successful innovators within the past five decades, who have advanced on the societal ladder a great deal, who have an extremely poor upbringing in terms of education and childhood.

Stiglitz (2012) argues that the American dream, as advertised by classical economists, is effectively dead for a majority of the population. Although hard work and innovation could theoretically result in someone from a poor educational background advancing in society (and perhaps this still happens to a tiny fraction of the population), it is extremely unlikely. In effect, Stiglitz claims that the “game” of modern American capitalism is rigged against the majority of the population, as due to poor access and quality of education, and the other various negative issues caused by inequality, one might find it almost impossible to succeed, despite their best effort and skills.

As such, Stiglitz (2012) and others (Piketty, 2015; Rajan, 2010) tend to reject the statements of classical economists who champion the current form of capitalism as a natural and just mechanism of weeding out the losers, and lifting up the winners. Although many current hugely successful individuals might not have had the greatest financial fortunes when they started their businesses, most (if not all) of them have a good educational background, and access to the other resources required by innovation. In this sense, in most cases social mobility is possible only in the mid-tiers of a society: the people who might not have great amounts of inherited wealth, but have received a decent education and enjoyed a normal, healthy childhood have the capacity to advance towards the upper tiers. As a contrast, those at the very bottom have extreme difficulties even getting to the mid-tiers, as they lack the basic building blocks of success in the modern, skills and knowledge-based economy.

The problem of “from the top” inequality, and over-education (as identified by Huo: 2015) also rears its head in the case of social mobility in times of economic recession or slow growth – when production slows, and jobs become scarcer, people have to increasingly

compete for them with means other than practical competence and suitability. As such, the academic requirements for jobs become steeper, exacerbating the problem, as even the decently educated have trouble finding positions matching their levels of skills and education.

Although the idea of the perfect market, and its capability in effecting just distribution of resources and wealth, is completely sound on paper, one has to question its proper functioning in the current global climate of decreasing economic growth rates and increasing inequality and political saturation. The conclusion shared by Stiglitz (2012), Rajan (2010) and Piketty (2015) is that the capitalistic system can be fair (and perhaps has been during certain periods in the past), but in many countries, is not currently. As such, many current economies do not allow social mobility to take place on a large scale, as only a relatively small fraction of the population has the capability to achieve it.

Researching technological development and social mobility, Hassler and Mora (2000) create a model which shows that social mobility occurs more readily during times of higher growth. This also supports Stiglitz (2012) and others' findings, which argue that the recent problem of inequality and decreased opportunity for social mobility is greatly exacerbated by the recent economic turmoil largely resulting from the crisis of 2008. Hassler and Mora (2000) argue that high growth increases the chance of an individual to get to utilize his innate abilities in the economy, as the selection and allocation of employees is more based on actual skills and knowledge, rather than social background.

Resulting from the "best" people getting the jobs they deserve, the economy also starts to experience more growth and function more effectively. As such, skills and merit-based allocation of human resources across an economy and high economic growth re-enforce each other, becoming a positive cycle (Hassler and Mora, 2000). Still, economic downturns do occur resulting from various market inefficiencies, be they inflated asset prices or a general feeling of a downturn coming, which becomes a self-fulfilling prophecy – and when these downturns occur, the positive cycle of social allocation based on innate ability and economic growth breaks.

### 5.3 Innovation Lowers Inequality

In addition to innovation's capacities in increasing inequality within a respective economy, it can also have an opposite effect, reducing inequality. On top of increasing individual social mobility (discussed in Chapter 5.2), innovation can also serve a greater overall function for the economy by acting as a form of "creative redistribution" (Huo, 2015: p. 143). In line with the principles of Schumpeter (1934), innovation can essentially shake-up the whole economy and re-organize the allocation of resources on the market.

Radical and incremental innovation both deliver new economic resources to the overall population, while allowing the innovators themselves to earn rent premiums resulting from their innovations. Innovators can either make better returns on existing products due to more gradual process innovations, or they can charge monopoly prices resulting from coming up with a new product. In this way, while innovation can also result in the creation of completely new wealth, it also acts as a form of re-distribution, as it transfers existing wealth from the rest of the society to the innovators (Huo, 2015).

The above claim essentially mirrors the viewpoint of Friedman (1962) and Lucas (2004) in arguing that the capitalistic market system acts as a righteous redistributive mechanism, allocating resources to the correct degree to innovators and hard-workers. As discussed in previous chapters, while this is theoretically logical and can be seen occurring in the real world to a certain extent, modern capitalism (especially during the past few decades) is displaying an increasingly perverted version of "righteous redistribution", where the people with the most advantageous backgrounds have vastly superior opportunities to seize resources for themselves.

Still, innovation's ability to improve the problem of inequality should not be underestimated – throughout history, large-scale innovation by certain individual's within a country has allowed the whole nation to benefit, creating economic growth, countless new jobs and improving the day-to-day life of the population (Hargadon, 2015). Finland offers an example with its flagship mobile tech corporation of Nokia in the late 1990s and early 2000s – Nokia created a vast amount of new growth in Finland, and placed the country on the global map as a serious contender in high-tech industries (Ornston, 2012). In this sense, Finland could be argued to have achieved social mobility on a nation-wide level, largely owing to the innovativeness of a relatively small number of individuals.

## 6 Conclusions

After reviewing the relevant literature and data regarding inequality and innovation, one can only conclude that the two phenomena have several clear links between them – one can also identify several mechanisms of cause and effect, through which inequality and innovation interact with each other. Although the thesis mainly focused on the relationship between inequality and innovation, it is also important to recognize each issue's importance on its own, and stay cognizant of the fact that both phenomena are extremely complicated and have multiple different factors which contribute to their creation – as such, the scope of this text has been decidedly narrow, but this should not be taken to mean that the issues themselves exist only in the scope they are discussed within this work.

When analysing the causes and effects of both inequality and innovation, one comes to view inequality as broadly-speaking negative, while viewing innovation as decidedly positive. Although inequality, in certain amounts (which are difficult to define on exact terms), is important for the health of a capitalistic economy, it should be maintained under control and minimized in order to provide a country with sustainable growth. Innovation, on the other hand, should be maximized for the same reasons. Although “too much” innovation can be destabilizing for an economy on the short-term, all technological advancement will usually result in an economy performing better on the long run, as long as inequality is kept in check.

As such, the topic of redistribution is at the centre of the relationship between inequality and innovation – as high levels of nation-wide innovation depend heavily on the overall population having access to basic resources promoting innovation, such as education, redistribution serves to diminish inequality not only through directly transferring money from the top to the middle and the bottom, but also by granting the general population access to these resources. In addition, decreased inequality also increases innovation through a myriad of other mechanisms, including increasing the size of the potential market for an innovator's products, ensuring that a respective society hosts the necessary support institutions to fund and assists entrepreneurs (which exist more readily in societies with lower inequality and higher taxation), and maintaining greater societal efficiency and political stability.

Despite high inequality's ill effects on innovation, it also has some positive attributes. Motivation is a key aspect of innovation, as the creativity and “outside the box” thinking

required by coming up with new ideas is very dependent on internal factors, and cannot be effectively forced externally. A suitable degree of inequality makes the prospects of creating new products and services more enticing, as one can be sure that his or her efforts will be rewarded accordingly. On the more negative side, it can be argued that inequality also boosts motivation by making the prospects of living without attaining the monetary benefits of innovation and hard work unbearable – in other words, people who have no inherited wealth and live in an unequal society have to innovate and work hard if they wish to escape their difficult circumstances.

Despite innovation's capabilities in inducing new economic growth, lowering inequality and increasing social mobility, the phenomenon also has the capacity to increase inequality. Innovation allows its creators to charge rents from the rest of the society, and depending on the nature of a respective innovation and the type of society it is created in, these rents can be extremely large. This allows the few successful innovators to amass huge fortunes, at the expense of the rest of the population. In more liberal market economies innovation creates more inequality from the top echelons of the society, as only the people with the best education and highest degrees have access to the best positions, while in more coordinated (often European) market economies inequality is created from the bottom, as only the people with an extremely lacking educational background are left out of the top positions.

All in all, inequality and innovation are both complex issues which require more research on the part of national governments, economists and different international agencies. Although the relationship between the two phenomena are clearly outlined in theoretical terms, one finds it difficult to find empirical data demonstrating the different mechanisms through which they affect each other. As such, supposed "evidence" of the functioning of certain mechanisms has to be largely inferred, which leaves significant room for error. Still, this work has managed to highlight the different facets of the relationship between economic inequality and innovation on clear terms, which should make any future, more comprehensive, research easier.



## 7 Recommendations

There are several ways through which the problems created by inequality and innovation's negative interaction can be addressed. In the author's opinion, nations should both focus on attempting to tackle the issues separately (lowering inequality and increasing innovation), while also addressing the negative outcomes caused by the two phenomena's combination.

Reviewing the relevant literature and data, one comes to the conclusion that nations should lower inequality, with increased redistribution being one of the primary mechanisms to achieve this. Redistribution can be achieved through several different ways, some being increased progressive taxation, wealth transfers from the state to the poorer population and the government offering subsidies for new companies and entrepreneurs. On top of direct redistribution, countries should also focus on providing citizens with an equal access to education, health care services and various support institutions which foster innovation.

On the side of innovation, nations' primary focus should also be on education. Although innovation is dependent on various factors which are difficult to define on exact terms, good education is one of the primary foundations of ensuring that the overall population has the best possible chances to become future innovators. More specifically, education should be geared towards fostering "innovation-specific" skills, such as independent critical thinking, creativity and effective social and communication skills. Countries could also create (and/or provide more funding to) different national agencies to promote innovation, perhaps embarking on joint research ventures with entrepreneurs and businesses, and providing support services in terms of patent registration and free legal aid.

On top of addressing inequality and innovation separately, nations should seek to prevent the destructive cycles the two can create together. As identified in the above paragraphs, improving the quality and access to education aids both issues separately, and serves to prevent a negative cycle between the two issues, where they start to increase each other. As such, education is perhaps the most important aspect of addressing the problems related to inequality and innovation discussed in this work.

In addition, countries should seek to diminish innovation's capability in creating more inequality. Radical innovation especially, through its ability to offer its creators the chance to charge increasingly high rents from the rest of the society, often contributes to wealth

amassing to the top echelons of society – this is especially problematic in liberal market economies, where the problem of over-education is also prevalent. Stricter progressive taxation could be a solution, as some of the wealth generated by radical innovation could be transferred to the rest of the society – tax exemptions could be offered to innovators should they use a significant portion of their profits in new R&D, attempting to create additional new innovations. Modifying patent legislation could also be a prospect – certain business sectors, such as the pharmaceutical industry, offer plenty of examples where powerful companies have the capacity to charge extortionate prices from the rest of the society based on a specific patent they hold. Legislation could be changed so that the time patents are in possession of a single entity would be reduced. Governments could also attempt to affect more control over the pricing policies of specific industries, to prevent over-charging in the case of a monopoly.

Nations where over-education is a clearly diagnosed problem could also attempt to embark on a course of stricter coordination between educational institutions and firms. Countries such as the United States and Great Britain, for example, could benefit from increased communication between schools and universities, and the nations' students' future employers. A revamped curriculum aimed at ensuring that students are trained in the skills necessary for a particular position would greatly reduce the problem of over-education, and could possibly lead to more innovation, in addition to a more stable economy.

Still, it is important to effectively maintain innovators' motivation to innovate, and not destroy it through implementing too strict policies in terms of redistribution, or legislation changes. The balance between inequality and innovation is an extremely difficult issue to determine, and will surely require some experimentation.

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